REMARKS

Claims 1-8, 23-25, 30, and 31 are pending in the present application.

It is noted that claims 23-26 have been amended to be dependent upon independent claim 1, and thus, claims 23-26 should no longer be held as withdrawn from consideration for these claims depend from generic independent claim 1.

Claim 8 has been rejected under 35 U.S.C. §112, second paragraph. This rejection under 35 U.S.C. §112, second paragraph, is respectfully traversed.

As respectfully submitted above, claim 8 has been amended to remove the language referencing a conventional interconnect.

Therefore, in view of the above amendments and remarks, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Claim 1 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Bernstein et al. (US-A-6,388,789). This rejection under 35 U.S.C. §103(a), to claim 1, is respectfully traversed.

As respectfully submitted above, amended independent claim 1 recites a metallization stack in an integrated MEMS device. The metallization stack includes a silicide layer formed on a semiconductor substrate of the integrated MEMS device; a titanium-tungsten layer, formed on the silicide layer, to operatively contact an electrically conductive structure in the semiconductor substrate of the integrated MEMS device, and a platinum layer formed over the titanium-tungsten layer.

In contrast, Bernstein et al. discloses, in Figure 9F, a stack of layered materials that comprises a layer of titanium-tungsten and a metal layer consisting of copper, silver, gold, and/or palladium. Therefore, Bernstein et al. fails to disclose or suggest a metallization stack comprising a silicide layer formed on a semiconductor substrate of the integrated MEMS device; a titanium-tungsten layer, formed directly on the silicide layer, to operatively contact an electrically conductive structure in the semiconductor substrate of the integrated MEMS

device, and a platinum layer formed over the titanium-tungsten layer, as set forth in amended independent claim 1.

Accordingly, in view of the above amendments and remarks, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Claims 1, 5, and 6-8 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Steitz et al. (US-A-5,358,826). This rejection under 35 U.S.C. §103(a), to claims 1, 5, and 6-8, is respectfully traversed.

As respectfully submitted above, amended independent claim 1 recites a metallization stack in an integrated MEMS device. The metallization stack includes a silicide layer formed on a semiconductor substrate of the integrated MEMS device; a titanium-tungsten layer, formed directly on the silicide layer, to operatively contact an electrically conductive structure in the semiconductor substrate of the integrated MEMS device, and a platinum layer formed over the titanium-tungsten layer. The claimed metallization stack provides corrosion resistance and nobility.

In contrast, Steitz et al. discloses, in Figure 12, a stack of layered materials that comprises a layer of titanium-tungsten and a metal layer of platinum to provide a barrier. Therefore, Steitz et al. fails to disclose or suggest a metallization stack comprising a silicide layer formed on a semiconductor substrate of the integrated MEMS device; a titanium-tungsten layer, formed on the silicide layer, to operatively contact an electrically conductive structure in the semiconductor substrate of the integrated MEMS device, and a platinum layer formed over the titanium-tungsten layer, as set forth in amended independent claim 1, to provide corrosion resistance and nobility.

Accordingly, in view of the above amendments and remarks, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Claims 1-8 has been rejected under 35 U.S.C. §103(a) as being unpatentable over Sinha (US-A-3,923,559) in view of Steitz et al. (US-A-5,358,826). This rejection under 35 U.S.C. §103(a), to claims 1-8, is respectfully traversed.

In formulating the rejection under 35 U.S.C. §103(a), the Examiner alleges that Sinha discloses a metallization stack wherein a titanium nitride layer (item 20 of Figure 1.3 of Sinha)

contacts an active silicon element via a silicide layer (item 18 of Figure 1.3 of Sinha). The Examiner further alleges that Sinha fails to expressly disclose that a titanium-tungsten layer contacts the silicide layer, but that Steitz et al. teaches that a titanium-tungsten layer can be used instead of a titanium nitride layer. From these various allegations, the Examiner concludes that the presently claimed invention would be obvious to one of ordinary skill in the art. These allegations and conclusion are respectfully traversed.

The present invention, as set forth in independent claim 1, is directed to a metallization stack in an integrated MEMS device. The metallization stack includes a silicide layer formed on a semiconductor substrate of the integrated MEMS device; a titanium-tungsten layer, formed directly on the silicide layer, to operatively contact an electrically conductive structure in the semiconductor substrate of the integrated MEMS device, and a platinum layer formed over the titanium-tungsten layer. The claimed metallization stack provides corrosion resistance and nobility.

On the other hand, Sinha teaches the formation of a titanium layer upon the silicide layer, and then a titanium-nitride layer formed upon the titanium layer, with a platinum layer formed on the titanium-nitride layer, as set forth in Column 5, lines 2-5 of Sinha. More specifically, Sinha fails to teach or suggest a titanium-tungsten layer, formed directly on a silicide layer, to operatively contact an electrically conductive structure in the semiconductor substrate of the integrated MEMS device.

Even if the teachings of Sinha could be modified by the teaching of Steitz et al., as proposed by the Examiner, such that the titanium-nitride layer is replaced with a titanium-tungsten layer, the resulting metallization stack would consist of a titanium layer upon a silicide layer, and then a titanium-tungsten layer formed upon the titanium layer, with a platinum layer formed on the titanium-tungsten layer. Such a structure would not teach nor suggest one of ordinary skill in the art to form a metallization layer wherein the metallization stack would consist of a titanium-tungsten layer upon the silicide layer, and then a platinum layer formed on the titanium-nitride layer, as set forth in amended independent claim 1, to provide corrosion resistance and nobility.

Therefore, Sinha and Steitz et al., singly or in combination, fails to teach or suggest the presently claimed invention as set forth in amended independent claim 1.

Accordingly, in view of all the reasons set forth above, the Examiner is respectfully requested to reconsider and withdraw this rejection. Also, an early indication of allowability is earnestly solicited.

Attached to this Response is a marked-up copy of the claims showing the amendments as presented above.

Respectfully submitted,

Matthew E. Connors
Registration No. 33,298
Samuels, Gauthier & Stevens
225 Franklin Street, Suite 3300
Boston, Massachusetts 02110
Telephone: (617) 426-9180
Extension 112

MEC/MJN/mjn
Attachments

Marked-up Version of Claims for US Patent Application Number 10/044,099

1. (Amended) A metallization stack in an integrated MEMS device, the metallization stack comprising:

a silicide layer formed on a semiconductor substrate of the integrated MEMS device;

a titanium-tungsten layer, formed directly on said silicide layer, to [that] operatively [contacts] contact an electrically conductive structure in the semiconductor substrate of the integrated MEMS device, and

a platinum layer formed over said [the] titanium-tungsten layer.

2. (Amended) The metallization stack of claim 1, wherein said [the] electrically conductive structure is an active silicon element [in a semiconductor substrate of the integrated MEMS device].

3. (Amended) The metallization stack of claim 2 wherein [the titanium tungsten layer contacts the active silicon element via a platinum silicide layer formed on the semiconductor substrate; and] the semiconductor substrate has an insulating film formed thereon, the insulating film has a contact hole formed therein, the contact hole exposes a portion of the surface of the semiconductor substrate at a bottom of the contact hole and said [the platinum] silicide is formed only on the exposed portion of the surface of the semiconductor substrate.

8. (Amended) The metallization stack of claim 7 wherein the electrically conductive structure is [a conventional] an interconnect of the Bio-MEMS device.

23. (Amended) The metallization stack of claim 1 wherein [An integrated MEMS device, the device comprising: a] the semiconductor substrate has [having] an insulating film formed thereon;

the insulating film has a contact hole formed therein, the contact hole exposes a portion of the surface of the semiconductor substrate at a bottom of the contact hole and said silicide is formed only on the exposed portion of the surface of the semiconductor

<u>substrate</u> [in the insulating layer; a platinum silicide layer formed at the surface of the semiconductor substrate exposed at a bottom of the contact hole; a titanium-tungsten layer formed on the platinum silicide, and]<u>;</u>

<u>said platinum layer being a portion of</u> a platinum wire formed on the insulating film, [the platinum wiring including a portion] <u>said platinum layer portion of the platinum wire being</u> formed on <u>said</u> [the] titanium-tungsten layer.

24. (Amended) <u>The metallization stack</u> [The integrated MEMS device] of claim 23 wherein the integrated MEMS device is an optical MEMS.

25. (Amended) <u>The metallization stack</u> [The integrated MEMS device] of claim 23 wherein the platinum wire is formed by:

depositing platinum on the insulating layer and the titanium-tungsten layer;

depositing an oxide hardmask over the platinum;

removing the oxide mask except for a portion of the oxide hardmask where the platinum wire is to be formed;

removing the platinum except for a potion of the platinum under the remaining oxide hardmask via a combination of dry etching and wet etching[,]<u>;</u> and

removing the remaining oxide hardmask.

26. (Amended) <u>The metallization stack</u> [The integrated MEMS device] of claim 25 wherein the platinum is removed by sputter etching the platinum in argon followed by wet etching in aqua regia.

--30. The metallization stack of claim 1, wherein said silicide layer is a platinum silicide layer.--

--31. The metallization stack of claim 23, wherein said silicide layer is a platinum silicide layer.--